Claims

1. A method of manufacturing a radiation detector having one or more conductive contacts on a semiconductor substrate, the method including the steps of:

applying a first conductive layer to a first surface of the semiconductor substrate;

applying a second conductive layer to form a plurality of contiguous layers of conductive materials, said plurality of contiguous layers including said first conductive layer; and

selectively removing parts of said plurality of contiguous layers so as to form said conductive contacts, the conductive contacts defining one or more radiation detector cells in the semiconductor substrate.

2. A method according to claim 1, including applying a third layer between said first and second layers, said third layer being a conductive layer.

3. A method according to claim 1, including applying a further layer to the second layer, said further layer being a conductive layer.

4. A method according to any one of the preceding claims, including

forming a layer of passivation material on said conductive contacts and the regions around conductive contacts; and

removing portions of said passivation material overlying said conductive contacts to expose the conductive contacts.

5. A method according to any one of the preceding claims, including:

forming a layer of photoresistive material on said substrate surface;

selectively exposing said photoresistive material and removing said photoresistive material from areas corresponding to said contact positions to expose said semiconductor substrate surface;

forming at least said first and second layers of conductive material on remaining photoresistive material and on said exposed semiconductor substrate surface; and

removing conductive material overlying said remaining photoresistive material by removing said remaining photoresistive material.

6. A method according to any one of the preceding claims, wherein the step of removing portions of said passivation material overlying said conductive contacts to expose the conductive contacts comprises:

forming a further layer of photoresistive material over said passivation layer;

selectively exposing said further layer of photoresistive material and removing said further photoresistive material to expose portions of said passivation layer corresponding to said contact positions;

removing said exposed portions of passivation material; and

removing remaining further photoresistive material.

7. A method according to any one of claim 5 or claim 6, wherein said portions of said passivation layer are removed from areas smaller than the size of said conductive contacts such that the passivation layer overlaps said conductive contacts.

8. A method according to any one of the preceding claims, wherein each of said first and second layers is applied by sputtering, evaporation, electrolytic deposition, or electroless deposition.

9. A method according to any one of the preceding claims, including forming a layer of conductive material on a surface of said substrate opposite to said first surface.

10. A radiation detector having a semiconductor substrate, comprising:

a plurality of conductive contacts arranged along the semiconductor substrate, the conductive contacts defining one or more radiation detector cells in the semiconductor substrate,

wherein each of the conductive contacts comprises a plurality of contiguous layers of conductive materials comprising a first conductive layer and a second conductive layer.

11. A radiation detector according to claim 10, wherein the first layer is a contact layer arranged to provide chemical contact between the conductive contacts and the substrate.

12. A radiation detector according to claim 10 or claim 11, wherein the second layer is a diffusion barrier layer arranged to protect the substrate from parts adjacent said conductive contacts.

13. A radiation detector according to any one of claim 10 to claim 12, including a third conductive layer adjacent said first layer and said second layer.

14. A radiation detector according to claim 13, wherein the third layer is an adhesion layer arranged to provide adhesion between said first and second layers.

15. A radiation detector according to any one of claim 10 to claim 14, including a further conductive layer adjacent said second layer.

16. A radiation detector according to claim 15, wherein the radiation detector includes a further semiconductor substrate, the further semiconductor substrate being connectable to the semiconductor substrate by charge receiving means, and said further conductive layer being a wetting agent arranged to provide chemical bonding between the conductive contacts and said charge receiving means.

17. A radiation detector according to any one of claim 10 to claim 16, wherein the first layer is of a different type of conductive material to that of the second layer.

18. A radiation detector according to any one of claim 10 to claim 17, wherein said first layer comprises platinum and the second layer comprises nickel.

19. A radiation detector according to any one of claim 10 to claim 17, wherein said first layer comprises platinum and the second layer comprises gold.

20. A radiation detector according to claim 15 when dependent on claim 13, wherein the third and further layers are of the same type of conductive material as one another.

21. A radiation detector according to claim 20, wherein the third and further layers comprise gold.

22. A radiation detector according to any one of claim 10 to claim 21, wherein each of the plurality of contiguous layers is one of nickel, gold, platinum, indium, titanium, tungsten, a nickel/gold alloy or a titanium/tungsten alloy.

23. A radiation detector according to any one of claim 10 to claim 22, including passivation material around individual conductive contacts.

24. A radiation detector according to any one of claim 10 to claim 23, wherein said conductive contacts define an array of pixel cells.

25. A radiation detector according to claim 24, wherein said contacts are substantially circular and are arranged in a plurality of rows, with alternate rows preferably being offset from adjacent rows.

26. A radiation detector according to any one of claim 10 to claim 25, wherein said conductive contacts define a plurality of strips arranged parallel to one another.

27. A radiation detector according to any one of claim 10 to claim 26, wherein, in a direction parallel to the plane of the substrate, said conductive contacts are from about 5μm about to about 100μm in size and distributed with a pitch from about 7μm to about 500 μm.

28. A radiation detector according to any one of claim 10 to claim 27, wherein, in a direction parallel to the plane of the substrate, said conductive contacts are of the order of 15 μm in size and distributed with a pitch of the order of 35 μm.

29. A radiation detector according to any one of claim 10 to claim 28, wherein the resistivity between conductive contacts is in excess of 1GΩ/square, preferably in excess of 10Ω/square, more preferably in excess of 100GΩ/square and even more preferably in excess of 1000GΩ/square (1TΩ/square).

30. A radiation imaging device according to any one of claim 15 to claim 30, wherein said further semiconductor substrate comprises one or more of the following:

charge accumulation circuitry; counter circuitry; readout circuitry; energy discriminator circuitry; pulse shaping circuitry; pulse amplifying circuitry; analogue to digital converter circuitry; and rate divider circuitry.

31. A radiation detector comprising a semiconductor substrate having one or more conductive contacts for respective radiation detector cells on a first surface thereof and a layer of conductive material on a surface of said substrate opposite to said first substrate, each conductive contact having a first face adjacent the first surface of the substrate and a second face opposite the first face, wherein the second face has a smaller surface area than that of the first face.

32. A method of manufacturing a radiation imaging device comprising:

manufacturing a radiation detector in accordance with any one of claim 1 to claim 9; and

individually connecting individual detector cell contacts for respective detector cells to corresponding circuits on a readout chip.